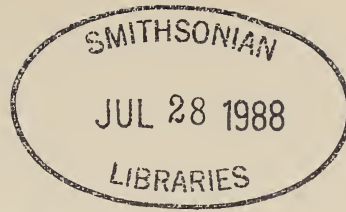


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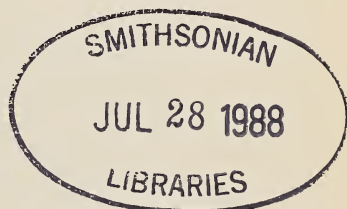
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KOH, A. J. 1960a. Ecological notes on *Conus* (Mollusca: Gastropoda) in the Trincomalee region of Ceylon. *Annals and Magazine of Natural History* (13) 2 (17): 309-320.
KOH, A. J. 1960b. Spawning behaviour, egg masses and larval development in *Conus* from the Indian Ocean. *Bulletin of the Bingham Oceanographic Collection, Yale University* 17 (4): 1-51.
THEILE, J. 1910. Mollusca. B. Polyplacophora, Gastropoda marina, Bivalvia. In: SCHULTZE, L. *Zoologische und anthropologische Ergebnisse einer Forschungsreise im westlichen und zentralen Süd-Afrika ausgeführt in den Jahren 1903-1905* 4 (15). *Denkschriften der medizinisch-naturwissenschaftlichen Gesellschaft zu Jena* 16: 269-270.

(continued inside back cover)

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OCHETOSTOMA (ECHIURA) FROM
SOUTHERN AFRICA WITH A
DESCRIPTION OF A NEW SPECIES

By

R. BISESWAR

Cape Town

Kaapstad

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OCHESTOSTOMA (ECHIURA) FROM SOUTHERN AFRICA WITH A DESCRIPTION OF A NEW SPECIES

By

R. BISESWAR

*Zoology Department, University of Durban-Westville, Durban
and Zoology Department, University of Cape Town, Rondebosch*

(With 23 figures and 1 table)

[MS accepted 17 August 1987]

ABSTRACT

In southern Africa, the genus *Ochetostoma* is currently represented by ten species: *Ochetostoma natalense* is described as new; *O. baronii*, *O. kemp*, *O. palense*, *O. decameron* and *O. formosulum* are redescribed and figured (the first four are new records for the region); *O. capense* and *O. arkati* are briefly diagnosed; *O. caudex* and *O. erythrogrammon*, recorded from several localities, are fairly well known. The status of one species from Park Rynie Beach, on the Natal coast, remains to be resolved. A key for the identification of all the species in the genus is provided, and the distribution of the southern African forms is briefly discussed.

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INTRODUCTION

At present, knowledge of the southern African echiuran fauna is rather scanty. This is the fourth in a series of papers on the systematics and distribution of the echiurans of Africa south of 20°S (Biseswar 1983, 1984, 1985). Biseswar (1985) dealt with the genera and species of echiurans from southern Africa and mapped their distribution, partly from the published works and partly from surveys made along the coast.

The present paper is a comprehensive report on the species of *Ochetostoma* from these waters. In their monograph, Stephen & Edmonds (1972) have outlined some of the taxonomic problems encountered in the group. It is evident from the literature that many of the species listed in this genus need re-examination and redescription.

Collecting trips, specifically in search of echiuroids, were undertaken to several localities along the Natal and Cape coasts. Most of the shallow-water

material used in this study was, however, obtained from the rocky shores of the Natal coast. Some species were also obtained as a result of requests made to several universities and institutions in South Africa. Unless otherwise stated in the text specimens were collected by the author. Abbreviations used in the figures are explained on p. 75.

Living specimens were photographed and then narcotized by adding small quantities of magnesium sulphate to sea-water. Measurements of the proboscis and trunk were taken after preservation in 10 per cent formalin. All the specimens were subsequently dissected and, where possible, variations were noted. Gross morphology was studied with the aid of a camera lucida.

DESCRIPTIONS

Ochetostoma Leuckart & Rüppell, 1828

Type-species: Ochetostoma erythrogrammon Leuckart & Rüppell, 1828.

Diagnosis

Longitudinal muscle layer of body gathered into distinct bundles. Inner oblique muscles between the longitudinal bands form fascicles. No anal or posterior setae. Gonoducts are paired, ranging from one to seven pairs. Gonostomal lips elongate and usually coiled.

Remarks

The genus is the largest of all the echiuran genera and comprises 24 species. It was only after the publications of Spengel (1912) and Wharton (1913) that the taxonomic importance of the condition of the oblique muscles was realized (Stephen & Edmonds 1972). Unfortunately, some of the earlier descriptions contain no information about the oblique muscles and hence the generic position of a number of species that have been assigned to the genus *Ochetostoma* is doubtful. They may belong to the genus *Listriolobus*. More detailed redescrptions of some of the species, based on additional material, are required before their taxonomic positions can be satisfactorily resolved.

Distribution

The genus *Ochetostoma* is very widely distributed in tropical and subtropical waters of the Indian, Atlantic and Pacific oceans. The majority of the species is confined to shallow waters of the intertidal zone but a few have been reported from considerable depths. In their monograph Stephen & Edmonds (1972) gave the distribution range of each species.

KEY TO THE SPECIES OF THE GENUS *OCHETOSTOMA*

The keys provided by Datta Gupta & Menon (1971) and Stephen & Edmonds (1972) for the species of *Ochetostoma* have been modified to accommodate *O. natalense* sp. nov. An attempt has been made to update the existing keys in the light of additional information obtained from the redescr-

tions of some of the species. In the present key, additional less rigorous characters have been included to assist in the identification of single individuals. A discussion of the structure and terminology of the group is included in a previous paper (Biseswar 1983).

1. Gonoducts 7 pairs 2
- Gonoducts 5 pairs or less 3
2. First pair of gonoducts presetal; 12 longitudinal muscle bands
..... *O. zanzibarensis* Stephen & Robertson, 1952
- All gonoducts postsetal; 7 longitudinal muscle bands
..... *O. senegalensis* Stephen, 1960
3. Gonoducts 5 pairs 4
- Gonoducts 4 or fewer pairs 5
4. First 3 pairs of gonoducts presetal; 19 longitudinal muscle bands
..... *O. hornelli* (Prashad, 1921)
- First 2 pairs of gonoducts presetal; 10–11 longitudinal muscle bands
..... *O. bombayensis* (Prashad & Awati, 1929)
5. Gonoducts 4 pairs, with first pair presetal 6
- Gonoducts 3 or fewer pairs 7
6. 10 longitudinal muscle bands *O. decameron* (Lanchester, 1905)
- 17–20 longitudinal muscle bands *O. kempi* (Prashad, 1919)
7. Gonoducts 3 pairs; only first pair presetal 8
- Gonoducts 2 pairs 12
8. Proboscis slightly bifurcated with ventral and terminal rims crenated;
18 longitudinal muscle bands; colour of trunk pink
..... *O. indosinensis* Wesenberg-Lund, 1939
- Proboscis not bifurcated, margins smooth 9
9. Small flat papillae confined to anterior and posterior surfaces of trunk; living
specimens red in colour; usually 12–13 longitudinal muscle bands, occa-
sionally 11–14 *O. australiensis* Edmonds, 1960
- Papillae distributed over entire surface of trunk, much larger posteriorly .. 10
10. Alimentary canal short, about three times trunk length; 15 longitudinal
muscle bands; bright green in life *O. palense* Ikeda, 1924
- Alimentary canal long, about five times trunk length 11
11. Integument thin and transparent in middle region of trunk; 12–18 longitu-
dinal muscle bands *O. erythrogrammon* Leuckart & Rüppell, 1828
- Integument thick and opaque throughout; usually 16–22 longitudinal muscle
bands, very occasionally 14–16 *O. caudex* (Lampert, 1883)
12. Interbasal muscle absent 13
- Interbasal muscle present 20
13. Lateral edges of proboscis modified 14
- Lateral edges of proboscis not modified 17
14. Gill-like processes along basal edges of proboscis; 8 longitudinal muscle
bands *O. arkati* (Prashad, 1935)
- Proboscis without gill-like structures 15

15. Proboscis with dendritic outgrowths; 7 longitudinal muscle bands
 *O. septemyotum* Datta Gupta, Menon & Johnson, 1963
 — Proboscis without dendritic outgrowths but proximal border with processes
 with scalloped edges 16
16. Oesophageal diverticulum present; 13 longitudinal muscle bands; trunk with
 30–35 rings of large oblong papillae . . . *O. mercator* Wesenberg-Lund, 1954
 — Oesophageal diverticulum absent; 12–13 longitudinal muscle bands; skin
 smooth with only a few rings of papillae at posterior end of trunk
 *O. glaucum* (Wesenberg-Lund, 1957)
17. 8 longitudinal muscle bands; proboscis one-third trunk length; integument
 translucent *O. octomyotum* Fisher, 1946
 — Muscle bands 10 or more 18
18. Trunk yellow in colour, covered with small uniformly distributed papillae;
 10–11 muscle bands *O. hupferi* (Fischer, 1895)
 — Trunk not yellow, papillae more densely packed at posterior end 19
19. Trunk light green to bluish in colour, up to 25 mm long and transparent in
 middle region; 13 longitudinal muscle bands . . *O. pellucidum* (Fischer, 1895)
 — Trunk reddish-purple, up to 94 mm in length; integument thick and opaque;
 17–20 longitudinal muscle bands *O. natalense* sp. nov.
20. Muscle bands less than 10 21
 — Muscle bands more than 10 22
21. Posterior end of trunk with a ring of elongate papillae; trunk up to 35 mm in
 length; 7–8 muscle bands *O. formosulum* (Lampert, 1883)
 — Posterior end of trunk without elongate papillae; trunk up to 120 mm in
 length; 7–8 muscle bands *O. capense* Jones & Stephen, 1955
22. Interbasal muscle extends over pharynx; trunk greyish-green; 14 longitudinal
 muscle bands *O. manjuyodense* (Ikeda, 1905)
 — Interbasal muscle passes below pharynx 23
23. Proboscis readily deciduous; oblique muscles between longitudinal bands well
 developed; 17–19 muscle bands *O. baronii* (Greeff, 1879)
 — Proboscis not readily deciduous; oblique muscles between longitudinal bands
 weakly developed; 18–21 muscle bands *O. myersae* Edmonds, 1963

Ochetostoma natalense sp. nov.

Figs 1–4, Table 1

Material

Holotype, SAM–A21924, in the South African Museum, Cape Town. Adult male, Park Rynie Beach, Natal (31°19'S 30°44'E); collected by K. S. Ganga, 18 October 1982.

Paratypes, SAM–A21925, in the South African Museum, Cape Town. Seven specimens from Park Rynie Beach, Natal (31°19'S 30°44'E) and Isipingo Beach, Natal (29°05'S 30°56'E); collected 1983, 1984.

Habitat

The specimens from Park Rynie Beach occurred in coarse sand under a projecting ledge of rock facing the shore, while those from Isipingo Beach were found under loose rocks in a rock tunnel. At both localities, the specimens were found in the intertidal area, close to the high-water mark.

Description

Size. Trunk length (holotype) 80 mm, proboscis length 58 mm. Of the paratypes, five sexually mature since gametes present in gonoducts. Trunk length of sexually mature specimens ranges from 54 mm to 94 mm and proboscis from 30 mm to 58 mm (Table 1); hence proboscis ranges from about one-third to three-quarters of trunk length.

TABLE 1
Measurements (in mm) of preserved specimens of *Ochetostoma natalense* sp. nov.

<i>Specimen</i>	<i>Total Length*</i>	<i>Trunk length</i>	<i>Ratio proboscis:trunk</i>
+Holotype	138	80	0,73
+Paratype	126	94	0,34
+Paratype	120	85	0,41
+Paratype	111	71	0,56
+Paratype	110	69	0,59
Paratype	86	50	0,72
Paratype	82	47	0,74
+Paratype	69	54	0,56

* Trunk length and proboscis length

+ Gametes present in gonoducts

Colour. In living specimens, proboscis is pale yellow. Trunk with reddish-purple longitudinal stripes marking longitudinal muscle bands, interspaces bluish-grey. Posterior extremity of trunk white, tinged with green in a few specimens. In preserved specimens colour changes to pale pink.

External features

Proboscis. Proboscis fleshy, non-deciduous and of uniform diameter throughout (Fig. 1A). Spatula-shaped in live animals but in preserved specimens lateral edges curl inwards to form a tubular structure. Lateral margins of proboscis smooth and free at base.

Trunk. Trunk sausage-shaped, more or less of uniform diameter (Fig. 1A). Papillae minute, densely arranged over most of trunk except at posterior end where they are very prominent, round to ovoid in shape. Size and distribution of papillae uniform in all specimens. A white mucous cap encases posterior extremity of trunk in formalin-preserved specimens. Entire integument thick and opaque. Longitudinal muscle bands range from 17 to 20, inner oblique muscle layer between longitudinal bands forming distinct fascicles. Ventral setae one

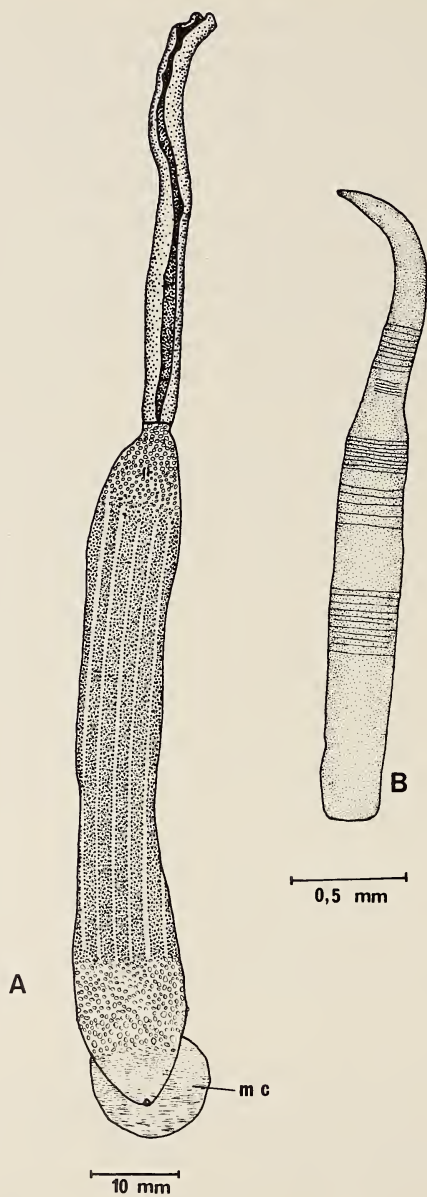


Fig. 1. *Ochetostoma natalense* sp. nov. A. Ventral aspect. B. Right functional seta.

pair, located at anterior end of trunk, close behind mouth. Genital pores two pairs, opening posterior to setae.

Setae. Each seta consists of a cylindrical shaft with curved terminal end tapering towards tip (Fig. 1B). Much narrower distal third of seta golden-yellow in colour while proximal two-thirds dark brown. Concentric markings present mainly on middle two-thirds of shaft. Each seta is invested in connective tissue and supported by radiating muscle strands as in other related species. There is no interbasal muscle between setae.

Internal anatomy

Alimentary canal. Alimentary canal is considerably longer than trunk and intricately coiled (Fig. 2). In holotype, numerous closely arranged mesenteric strands fasten gut to body wall (Fig. 2). Mesenteric strands fewer in paratypes and more sparsely arranged. Foregut comparatively small, terminating at ring vessel. After ring vessel, intestine pursues complicated course through body cavity, forming several ascending and descending limbs. A double sheet of mesentery fastens oesophagus to anterior part of body wall.

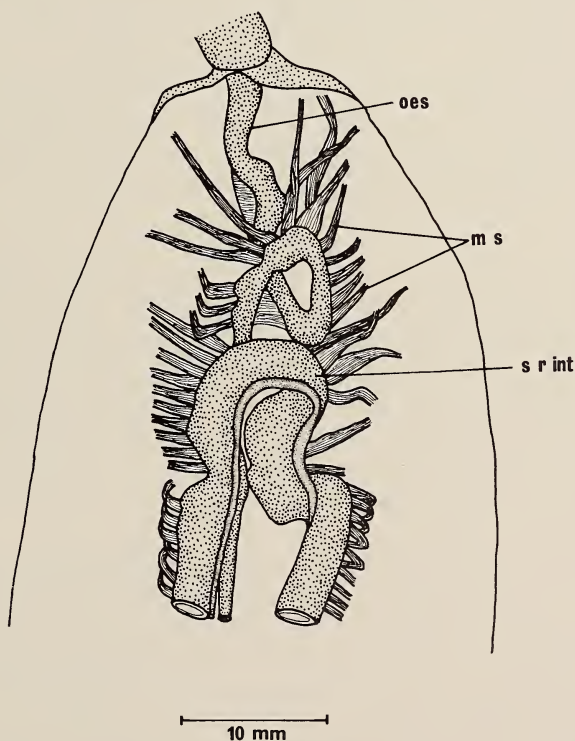


Fig. 2. *Ochetostoma natalense* sp. nov. Anterior part of the alimentary canal, showing the mesenteric strands.

Intestine proper commences soon after ring vessel and is differentiated into presiphonal, siphonal and postsiphonal regions. Presiphonal region marked by presence of ciliated groove, which in holotype is about 36 mm long. Intestine considerably dilated and extremely thin-walled in region of siphon, whereas in postsiphonal region it is narrow with fairly thick walls. Last part of intestine of uniform diameter, leading into more or less straight rectum. Small, spherical rectal caecum present in all specimens.

Anal vesicles. Anal vesicles elongate, distensible tubes lying in coelom and opening into rectum. In holotype, anal vesicles are abnormal (Fig. 3). Left anal vesicle about three-quarters length of trunk, while right one about one-fifth as long. In addition to these, a third anal vesicle present, which, instead of terminating blindly, forms a loop and reopens into rectum (Fig. 3). All three vesicles with numerous, tiny ciliated funnels. In paratypes, as in specimens of related species, anal vesicles are normal, and are almost equal to or longer than trunk. Numerous thin, mesenteric strands fasten proximal end of vesicle to body wall, whereas distally they loosely interweave through coils of intestine.

Gonoducts. Two pairs of elongate, tubular gonoducts are located behind setae; posterior pair much larger (Fig. 4A). In holotype, gonoducts are swollen at base. Gonostomal lips elongate and spirally coiled. Opening of gonostome basal in position. In sexually mature individuals, gonoducts considerably distended due to presence of gametes.

Blood system. Intestinal ring sinus is an incomplete vascular ring located at end of foregut (Fig. 4B). Neuro-intestinal vessel elongate, double for most of its length. Dorsal vessel, after arising from ring sinus, continues anteriorly, dorsal to oesophagus and pharynx, and enters proboscis.

Remarks

Distinctive features of the present species from southern Africa include the number and location of the gonoducts in relation to the setae, the presence of 17–20 longitudinal muscle bands, the nature of the integument, the characteristic shape and distribution of the dermal papillae, and the absence of an interbasal muscle. The interbasal muscle is a useful taxonomic character in echiurans. Other features of lesser significance are the colour and size of the animals and the ratio of the proboscis length to trunk length.

In the genus *Ochetostoma* there are 13 species that possess two pairs of gonoducts (see key p. 30).

The species *O. arkati*, described originally from Calcutta, India, differs from *O. natalense* in several respects. In the former species the longitudinal muscles are gathered into 7–8 bands and the proboscis is short, about a third to a quarter of the trunk length. However, the most important distinguishing feature of *O. arkati* is the presence of short, branched, gill-like processes along the edges of the posterior half of the proboscis.

The species *O. septemyotum* differs from other known echiurans in the genus in possessing a proboscis where the lateral margins are produced into a series of

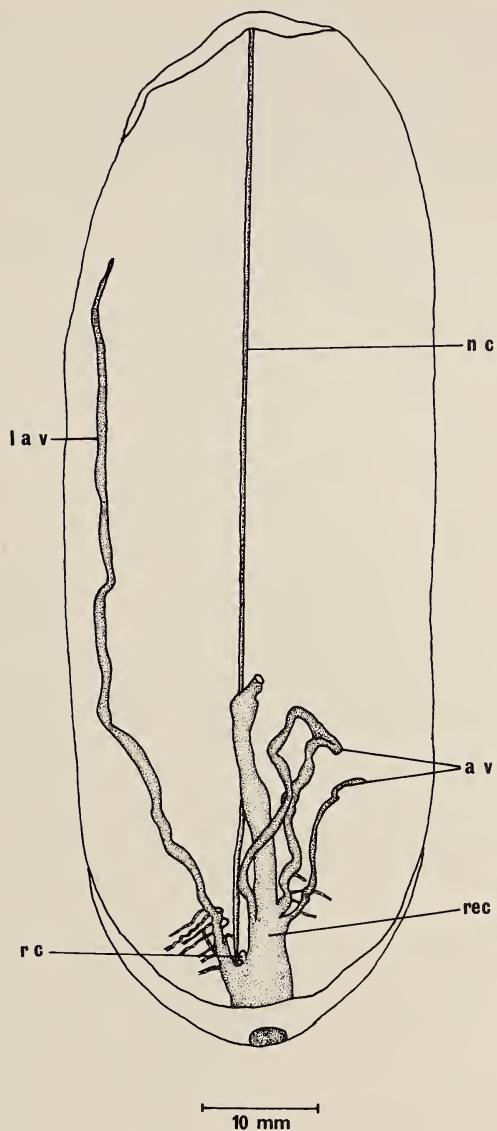


Fig. 3. *Ochetostoma natalense* sp. nov. Dorsal dissection of the trunk showing the abnormal anal vesicles of the holotype.

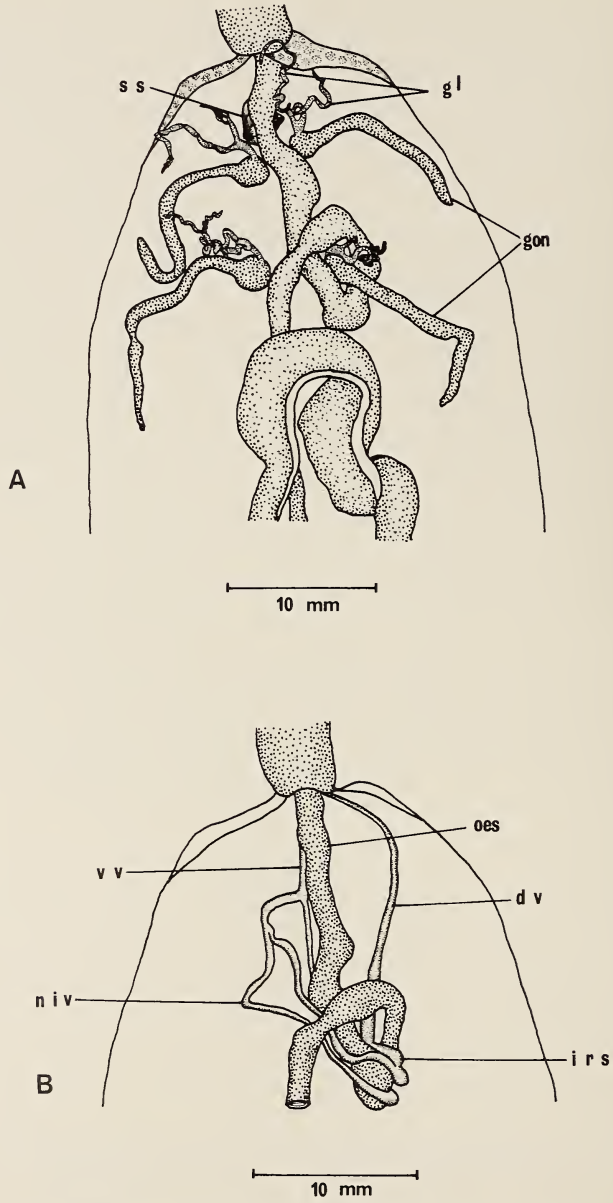


Fig. 4. *Ochetostoma natalense* sp. nov. Anterior end of the trunk cavity. A. Gonoducts. B. Blood vessels.

folds with dendritic outgrowths that are bent inwards into the proboscis groove.

Ochetostoma baronii, *O. capense*, *O. myersae* and *O. formosulum* are distinct from *O. natalense* in possessing an interbasal muscle that passes through a loop of the neuro-intestinal vessel. In addition, there are several other differences in the proboscis, integument and dermal papillae that separate the above species from *O. natalense*.

Ochetostoma hupferi from Nyango, West Africa, is based on a single damaged specimen recorded from a depth of 11 m. In this species, the trunk is small, light yellow in colour and covered with small, uniformly distributed papillae. The proboscis is 5 mm in length and the ventral setae are large, golden-yellow in colour. Fischer's description (1895) mentions that the longitudinal muscle layer is gathered into 10–11 bands. The most important differences between *O. hupferi* and *O. natalense* lie in the number of longitudinal muscle bands, in the size of the ventral setae and in the distribution of the dermal papillae. Differences are also present in size as well as in the colour of live animals.

The original description of *O. manjuyodense* is based on a single specimen from Manjuyodi, Philippines, in which the proboscis was missing. Fisher (1948) merely recorded this species from Hawaii. The trunk is 18 mm in length and has a greyish-green tint. The dermal papillae are minute, almost invisible to the naked eye, except at the posterior end where they are somewhat larger and arranged almost in circular rows. A very distinctive feature in this species is the interbasal muscle that extends over the pharynx. The longitudinal muscles are gathered into 14 broad bands. The anal vesicles are covered with numerous short-stalked funnels, which are visible to the naked eye. In addition to the interbasal muscle, important differences also occur in the size and distribution of the dermal papillae, in the number of muscle bands and in the colour of the animals.

Ochetostoma mercator, described by Wesenberg-Lund (1954), is known only from the holotype. In this species the trunk is 25 mm long and the proboscis, which is broad, fleshy and non-deciduous, is one-fifth its length. An important feature that distinguishes this species from *O. natalense* is the presence of 30–35 rings of large, oblong papillae on the trunk. Another difference lies in the longitudinal muscle layer, which in *O. mercator* is gathered into 13 bands. The proboscis of *O. mercator* is also much smaller in comparison with the length of the trunk.

Fisher (1946) erected the species *O. octomyotum* from several specimens collected from the Californian coast. His description mentions that the trunk of full-grown specimens is 110 mm long and the proboscis ranges from one-third to the full length of the body. The longitudinal muscle layer is gathered into eight bands, but in the posterior third of the trunk it forms a continuous sheet. The integument of *O. octomyotum* is translucent. Thus important differences between the two species lie mainly in the number of longitudinal muscle bands and in the

nature of the integument. As in *O. natalense*, the ventral setae have no interbasal muscle.

Ochetostoma pellucidum was described originally from several specimens from the West African coast at depths of 10 m. In this species the trunk, which is light green to bluish in colour, is 25 mm long and the proboscis is about one-quarter its length. The longitudinal muscles are gathered into 13 bands. Fischer's (1895) description mentions that the integument is opaque anteriorly and posteriorly but transparent in the middle region. Hence differences exist between *O. pellucidum* and *O. natalense* in the number of longitudinal muscle bands and in the nature of the integument. Other differences are present in the colour and size of the specimens. Furthermore, the anal vesicles of *O. pellucidum* are only about one-quarter as long as the trunk and the ventral setae are large.

The species *O. glaucum* is known from two rather badly preserved specimens. According to the description provided by Wesenberg-Lund (1957), the trunk is about 22 mm in length and the proboscis is 6 mm long. An interesting feature in this species is the presence of two rows of processes on the proximal part of the proboscis. The outer row consists of rather long lobes with slightly scalloped edges. The integument is smooth with only a few rings of papillae on the posterior part of the trunk. There are 12–13 longitudinal muscle bands. This species differs significantly from *O. natalense* in the structure of the proboscis, in the distribution of the papillae and in the number of longitudinal muscle bands.

Thus it is evident that *O. natalense* differs significantly from the other known species of *Ochetostoma* that possess two pairs of gonoducts, thereby justifying the establishment of a new species.

Etymology

This species is named after the province of Natal, along which coast it was found.

Ochetostoma baronii (Greeff, 1879)

Figs 5–7

- Thalassema baronii* Greeff, 1879: 151, pl. 6 (figs 62–67). Selenka, 1885: 8. Shipley, 1899a: 55; 1899b: 336, 345, pl. 33 (figs 1, 7). Sluiter, 1902: 47. Augener, 1903: 348. Verrill, 1904: 40. Lanchester, 1905: 34. Fischer, 1922: 15. Hérubel, 1924: 108.
Thalassema kefersteini A. ten Broeke, 1925: 94.
Ochetostoma baronii Fisher, 1946: 241. Stephen, 1960: 513. Mackie, 1961: 247. Stephen & Edmonds, 1972: 429. Amor, 1976: 123.
Ochetostoma edax Fisher, 1946: 245, fig. 14.

Type-locality

Arrecife, Canary Islands (Atlantic Ocean).

Material

One sexually mature female, Pontá Torres, west coast of Inhaca Island; collected by Zoology Department, Witwatersrand University, period 1956–1963.

Two juvenile specimens, Park Rynie Beach, Natal; collected 28 May 1983 and 8 September 1983.

Distribution

Numerous localities in tropical and subtropical waters of the Indian, Atlantic and Pacific oceans (Stephen & Edmonds 1972).

Habitat

At both localities the specimens were found under rocks in the intertidal zone. While the specimen from Inhaca occurred in mud in a permanent pool, those from Park Rynie were found in relatively coarse sand.

Description

Size. Trunk of preserved specimen from Inhaca 66 mm long, greatest diameter 17 mm; proboscis 18 mm long, detached from specimen. Trunk length of Park Rynie specimens 21 mm and 30 mm and proboscis length 6 mm and 8 mm, respectively. Hence proboscis ranges from about a quarter to one-third trunk length.

Colour. In living specimen from Inhaca Island, trunk purple, proboscis pale yellow with fine green stripes. Colour of trunk and proboscis of Park Rynie specimens rich dark green; green coloration due to symbiotic algae. In preserved specimens, colour ranges from pale pink to dull greyish-brown.

External features

Proboscis. Proboscis markedly deciduous. In living specimens may exceed half length of trunk. Proboscis spatula-shaped in living specimens but tubular when preserved (Fig. 5A). Anterior and lateral margins smooth and free at base of proboscis. In smaller specimen from Park Rynie, proboscis detached during narcotization.

Trunk. Trunk sausage-shaped, more or less of uniform diameter in both specimens from Park Rynie. Trunk of Inhaca specimen broad anteriorly but tapering at posterior end (Fig. 5B).

Entire integument of trunk densely covered with minute, rounded papillae. Papillae irregularly distributed, more closely arranged at extremities of trunk and larger posteriorly. Much smaller papillae interspersed among larger ones.

Integument translucent, parts of alimentary canal and nerve cord visible. Longitudinal muscles gathered into 18–20 bands. Inner oblique muscles between longitudinal bands distinctly fasciculated.

Setae. Setae one pair, located on antero-ventral surface of trunk, just posterior to mouth (Fig. 5B). Genital pores two pairs, opening behind setae. Each seta consisting of a cylindrical shaft with curved terminal end (Fig. 5C). Distal bent end slightly flattened. Cylindrical part of shaft with faint concentric markings. Setae embedded in connective tissue and located in cone-shaped setal sacs as in other species. Cylindrical interbasal muscle present.

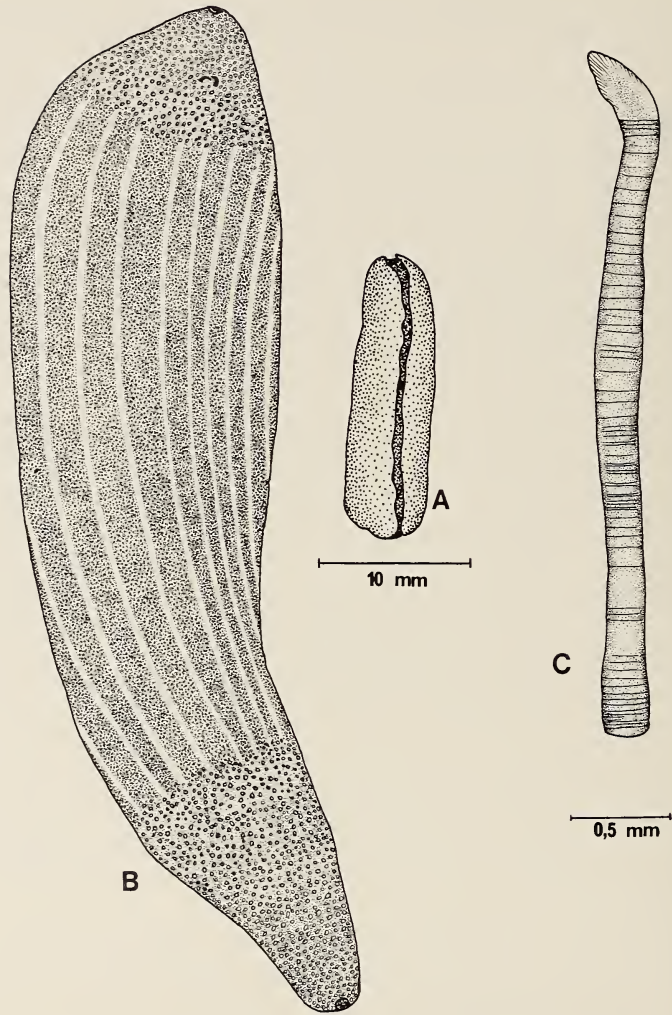


Fig. 5. *Ochetostoma baronii*. A. Detached proboscis. B. Ventral view of trunk. C. Left functional seta.

Internal anatomy

Alimentary canal. Alimentary canal long, coiled, about five times trunk length (Fig. 6). Foregut extremely small, ending at intestinal ring vessel. Gizzard and crop not distinguishable as no distinct boundaries present externally. Fine mesenteric strands fasten alimentary canal to body wall at several points. Numerous dilatations present in intestine due to presence of sand grains and shell fragments. Contents of intestine not in the form of pellets. Small preloacal caecum opening ventrally into rectum.

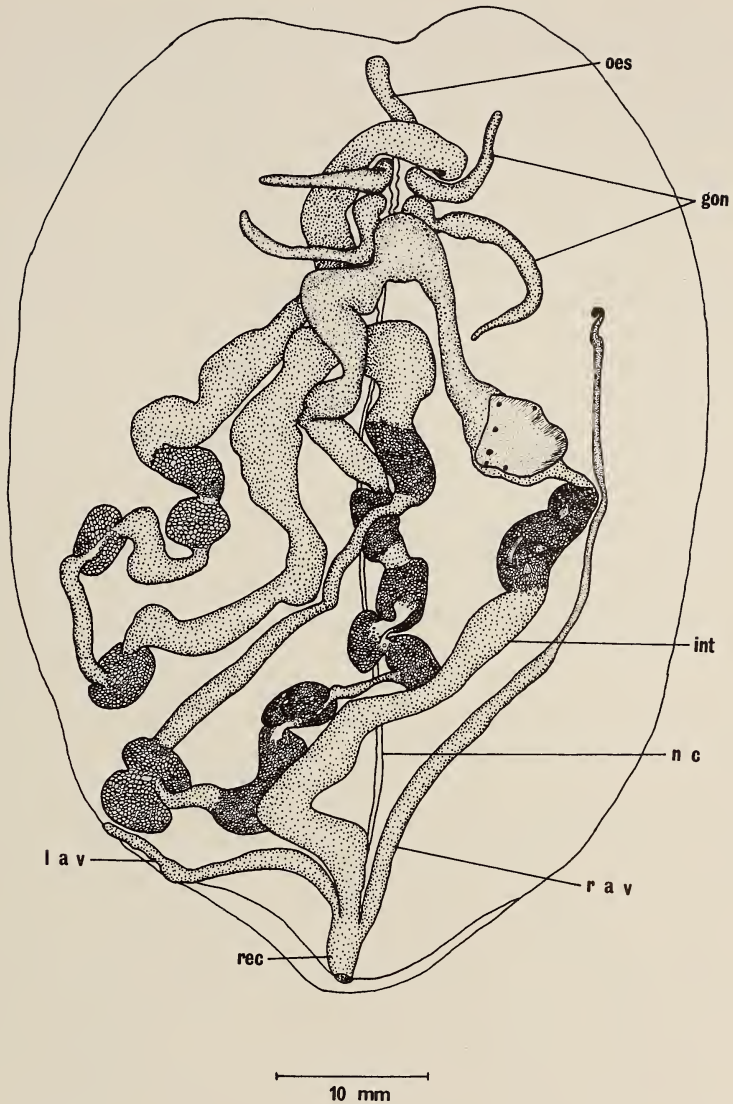


Fig. 6. *Ochetostoma baronii*. Dorsal dissection of the trunk, illustrating the alimentary canal and anal vesicles.

Anal vesicles. Anal vesicles thin-walled, unbranched, blind-ending tubes opening into rectum (Fig. 6). Right anal vesicle of *Inhaca* specimen two-thirds length of trunk, without ciliated funnels. Left vesicle approximately one-quarter length of trunk with tiny unstalked funnels on distal third. Right anal vesicle of smaller specimen from Park Rynie almost as long as trunk; left one less than one-third trunk length. Both vesicles in larger specimen almost equal to trunk length; ciliated funnels present on vesicles of both specimens.

Gonoducts. Gonoducts two pairs, located posterior to ventral setae (Fig. 7). Gonoducts of *Inhaca* specimen considerably distended due to presence of numerous ova. Gonostomal lips long, spirally coiled (Fig. 7). Openings of gonostomes basal in position. Both specimens from Park Rynie immature. Gonoducts oval in smaller specimen, somewhat elongate in larger one.

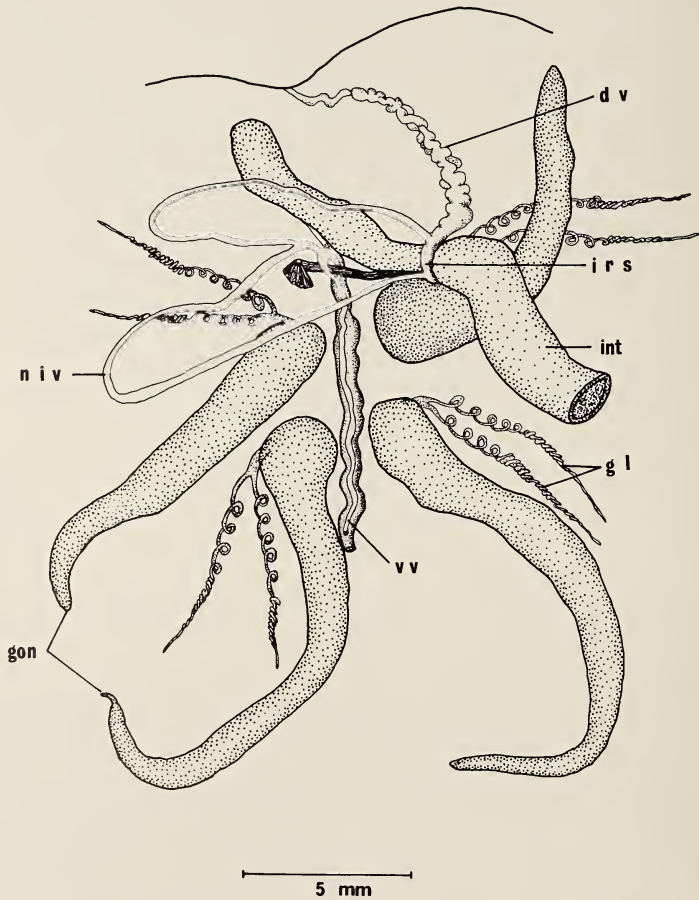


Fig. 7. *Ochetostoma baronii*. Anterior end of the trunk cavity, showing the blood system and gonoducts.

Blood system. Neuro-intestinal vessels paired, elongate, connecting dorsal and ventral vessels by means of intestinal ring sinus (Fig. 7). Ring sinus located at end of foregut. Interbasal muscle passes through loop of neuro-intestinal vessel. Dorsal vessel weakly coiled with numerous small dilatations, passes anteriorly and enters proboscis. Ventral vessel continues posteriorly, beside nerve cord, terminating in region of rectal caecum.

Remarks

The present specimens of *O. baronii* represent new records for the southern African region, extending the range of distribution southwards from the Zanzibar coast.

According to Greeff (1879), the trunk is up to 80 mm in length, dark green in colour with violet longitudinal muscle bands and white papillae scattered over the surface. The longitudinal muscle layer is gathered into 17–19 bands. Selenka's description (1885), however, mentioned the presence of 20–23 muscle bands. An interesting feature mentioned by Greeff (1879), Selenka (1885) and Shipley (1899a) is the presence of short branching outgrowths on the anal vesicles.

The present specimens of *O. baronii* from the east coast of southern Africa closely approach the description given by Greeff (1879), except for differences in the structure of the anal vesicles. All the specimens lack the branched outgrowths and conform with the descriptions provided by Fisher (1946), Lanchester (1905) and Amor (1976).

Furthermore, the specimens from southern Africa as well as those examined by Amor (1976) have a markedly deciduous proboscis, a feature that seems to have gone unnoticed by previous authors.

Amor (1976) examined the type specimens of *O. kefersteini* and *O. edax* and compared them with numerous specimens of *O. baronii* collected from the Canary Islands. From this investigation she concluded that both *O. edax* and *O. kefersteini* were synonymous with the species of Greeff. The present study supports Amor's conclusion.

The species of *O. myersae* Edmonds, 1963, based on four specimens from Long Reef, New South Wales, appears to be closely related to *O. baronii* and, according to Edmonds, the colour of living specimens is chlorophyll green. The length of the trunk ranges from 20 mm to 35 mm and the proboscis, which is not readily deciduous, is about a quarter to half the length of the trunk. The longitudinal muscles are gathered into 18–21 bands. An important difference between *O. myersae* and *O. baronii* lies in the oblique muscles, which in the former species are weakly developed. The integument is covered with soft, white, wart-like papillae, which are large and most conspicuous on the posterior third of the trunk. Edmonds (1963) reported the presence of two pairs of postsetal gonoducts in three of his specimens and only one pair in his largest specimen. As in *O. baronii*, an interbasal muscle is present that passes through a loop of the neuro-intestinal vessel. The anal vesicles are thin, elongate tubes that lack branched outgrowths. The ciliated funnels are borne on very short stalks. Hence

differences between *O. baronii* and *O. myersae* are apparent in the integument, the proboscis and in the size and arrangement of the dermal papillae. The differences appear to be sufficiently distinctive to retain these as two separate species.

Ochetostoma formosulum (Lampert, 1883)

Figs 8–10

Thalassema formosulum Lampert, 1883: 339. Shipley, 1899b: 348. Sluiter, 1902: 48, fig. 13. Wharton, 1913: 248. Prashad, 1921: 35.

Ochetostoma formosulum Fisher, 1946: 241. Wesenberg-Lund, 1963: 140. Datta Gupta *et al.*, 1963: 57, figs 1a–c. Stephen & Edmonds, 1972: 433.

Type-locality

Manila, Philippines.

Material

Two specimens, one sexually mature, from Durban Bay; collected by University of Cape Town Ecological Survey, 1963. One of these specimens (dissected) was described by Wesenberg-Lund (1963).

Distribution

Indo-West-Pacific, from Japan, the Philippines and Indonesia, and the Natal coast.

Habitat

Both specimens occurred in sand at a depth of 8–9 m.

Description

Size. Trunk of intact sexually mature specimen 22 mm long, greatest diameter 11 mm. Proboscis 5 mm long, less than one-quarter trunk length.

Colour. Dissected specimen cream, intact specimen pinkish-brown.

External features

Proboscis. Proboscis fleshy, highly contracted, non-deciduous and more or less spherical in outline (Fig. 8A). A series of tight ridges on lateral edges, margins frilled. Dorsal surface with small, scattered papillae. Proboscis with broad incision at anterior end. Lateral margins fused posteriorly, forming a narrow lower lip.

Trunk. Trunk broad at anterior end, tapering posteriorly (Fig. 8A). White papillae sparsely distributed over middle two-thirds or more of trunk, more closely arranged at extremities. Papillae arranged in rings at posterior end (Fig. 8A). Anus at tip of small, smooth conical projection. A ring of large, elongate papillae around base of conical projection about 3 mm away from posterior tip of trunk. Integument very thin and transparent, somewhat thicker

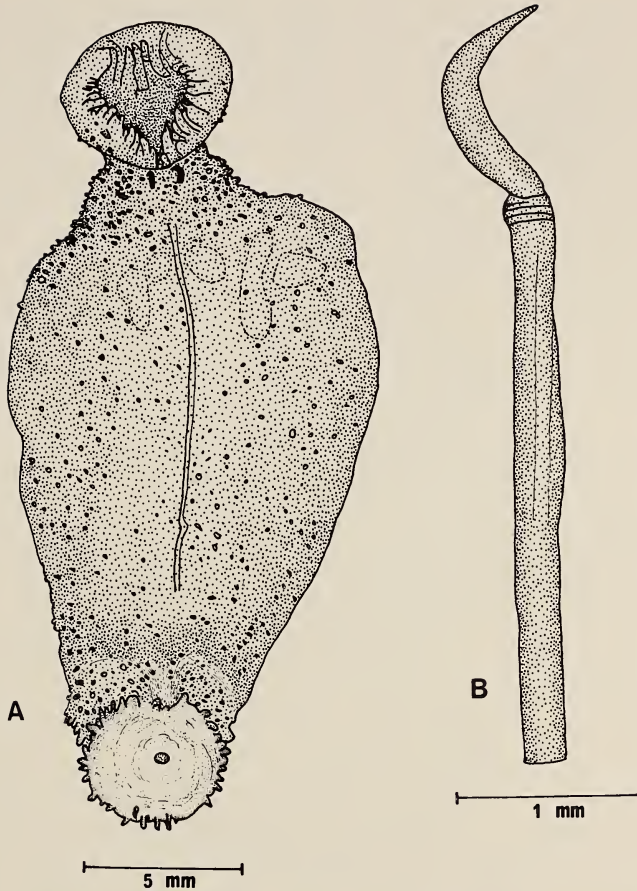


Fig. 8. *Ochetostoma formosulum*. A. Ventral aspect. B. Left functional seta.

and opaque posteriorly. Nerve cord, gonoducts and parts of alimentary canal visible through transparent body wall. Genital pores two pairs, postsetal. Muscle layers continuous over most of trunk. Longitudinal muscle bands indistinct except in posterior third of trunk where narrow bands faintly discernible. Inner oblique muscle layer fasciculated, visible only in posterior end of trunk.

Setae. Setae large, golden-brown in colour, hook-like, about 4 mm long (Fig. 8B). Terminal bent end flattened and clearly demarcated from straight, cylindrical part of shaft by a conspicuous ridge. Both setae located in special sacs, supported by numerous radiating muscle strands. Interbasal muscle cylindrical, passing through small loop of neuro-intestinal vessel.

Internal anatomy

Alimentary system. Alimentary canal long, highly coiled tube, fastened to body wall at several points by thin mesenteric strands. Pharynx club-shaped with

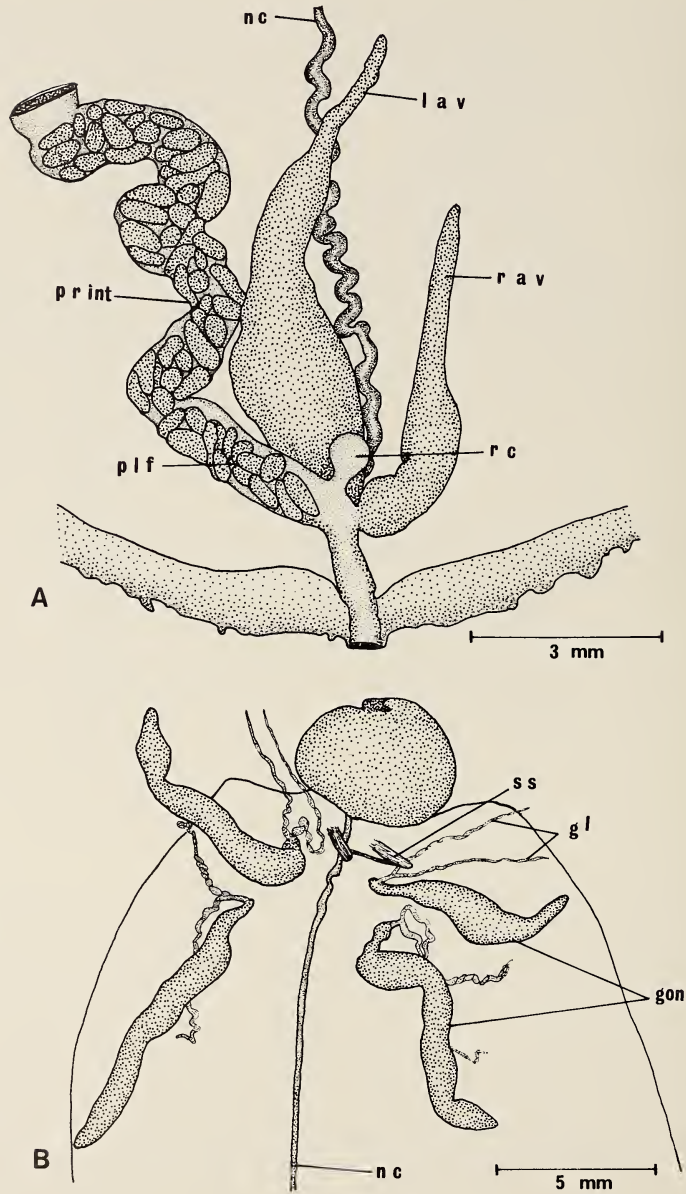


Fig. 9. *Ochetostoma formosulum*. A. Posterior end of trunk cavity, showing the anal vesicles and posterior part of the alimentary canal. B. Anterior part of the trunk cavity, showing the gonoducts.

thick muscular walls. Oesophagus narrow, more or less of uniform diameter. Foregut long, terminating at intestinal ring sinus. Presiphonal region of intestine with a ciliated groove. Intestine considerably dilated, extremely thin-walled and transparent in region of siphon. Entire intestine compactly filled with small, sausage-shaped faecal pellets consisting of fine sand particles (Fig. 9A). Rectal caecum small, spherical.

Anal vesicles. Anal vesicles small, about one-third trunk length, unbranched and transparent (Fig. 9A). Narrow anteriorly but considerably dilated and sac-like posteriorly. Ciliated funnels minute, stalked, sparsely distributed over surface of both vesicles.

Gonoducts. Gonoducts two pairs (Fig. 9B), posterior to ventral setae, oval in juvenile specimen but elongate, tubular and considerably distended in sexually mature individual due to presence of numerous ova. Gonostomal lips thin, spirally coiled; gonostomal openings basal in position.

Blood system. Intestinal ring sinus is an incomplete vascular ring at posterior end of foregut (Fig. 10). Dorsal vessel prominent, continuing anteriorly and entering proboscis. Paired neuro-intestinal vessels short, stout, forming small loop around interbasal muscle (Fig. 10). Heart conspicuous at posterior end of dorsal vessel. Ventral vessel terminating posteriorly in rectal caecum.

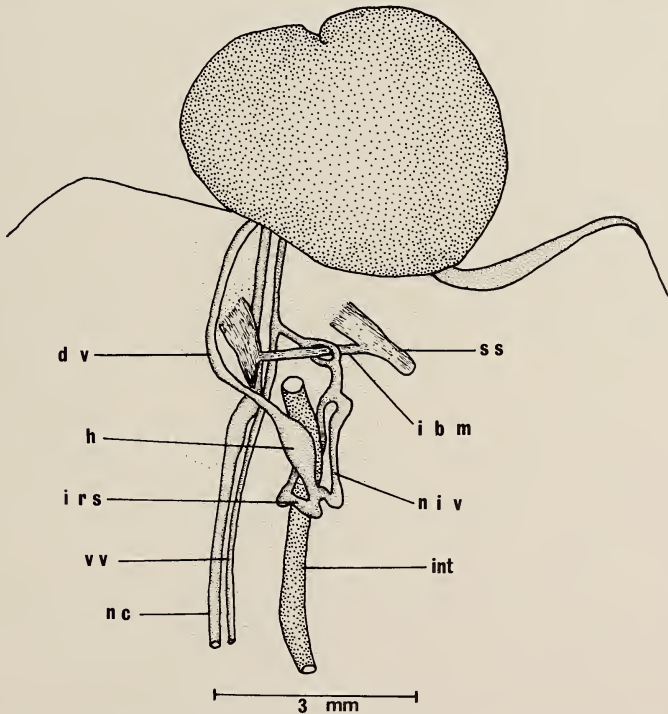


Fig. 10. *Ochetostoma formosulum*. Anterior part of the trunk cavity, showing the blood vessels.

Remarks

Ochetostoma formosulum (Lampert, 1883) was described from a single specimen from Manila, Philippines. This species was later recorded and described from several other localities in the Indo-West-Pacific Ocean. Wesenberg-Lund (1963) recorded and described a single specimen collected from a central sandbank in Durban Bay. Although this species is fairly well known, some features require further discussion.

The most important distinguishing features of *O. formosulum* are the presence of two pairs of postsetal gonoducts with spirally coiled gonostomal lips, a very thin and transparent integument, 6–8 longitudinal muscle bands and an interbasal muscle that passes through a loop of the neuro-intestinal vessel. Other taxonomic features include the proboscis which is less than one-quarter of the trunk length, the frilled lateral margins of the proboscis, and the characteristic shape and distribution of the dermal papillae.

It is rather surprising to note that, with the exception of Wharton (1913), none of the other authors mentioned the presence of an interbasal muscle in this species. In their key to species of *Ochetostoma*, Datta Gupta & Menon (1971) were incorrect in including *O. formosulum* with those species that lack an interbasal muscle.

The description provided by Lampert (1883) mentioned a trunk length of 30 mm and proboscis length of 8 mm. With the exception of the dermal papillae, the present specimens from Durban Bay closely correspond with Lampert's description. According to Lampert (1883) and Wharton (1913), the papillae are not arranged in transverse or longitudinal rows on any part of the trunk.

Sluiter's description (1902) was based on 21 well-preserved specimens from Siboga. The trunk ranged from 15 mm to 23 mm in length and the proboscis from 4 mm to 6 mm. Sluiter also mentioned the presence of a conical projection and a ring of large papillae at the posterior extremity of the trunk.

Wharton's description (1913) was based on a single individual from Samar. The trunk is 35 mm long and the proboscis is less than one-third its length.

The trunk of the single specimen described by Wesenberg-Lund (1963) is 17 mm long and the proboscis 6 mm. Hence from the description provided by the above authors, it is apparent that the proboscis ranges from a quarter to one-third the trunk length. Regarding the dermal papillae, Wesenberg-Lund (1963: 140) stated: 'The dermal organs show a slight tendency to an annular arrangement; they are nowhere especially crowded, and a small area round the posterior end seems almost smooth.'

The anal vesicles are broad and sac-like in the intact specimen from Durban Bay and hence similar to those described by Lampert (1883), Wharton (1913) and Datta Gupta *et al.* (1963). Wesenberg-Lund (1963), however, described these organs as white, transparent tubes.

Ochetostoma formosulum appears to be related to *O. septemyotum* and *O. arkati* in possessing two pairs of gonoducts and 7–8 longitudinal muscle bands. The latter two species, however, besides lacking an interbasal muscle, also differ

significantly in the structure of their proboscises. In *O. septemyotum* the lateral margins of the proboscis are produced into a series of folds with dendritic outgrowths; in *O. arkati* gill-like structures are present along the basal edge of the proboscis.

Ochetostoma decameron (Lanchester, 1905)

Figs 11–13

Thalassema decameron Lanchester, 1905: 35, pl. 1 (fig. 5).

Ochetostoma decameron Fisher, 1946: 241. Stephen & Edmonds, 1972: 432.

Holotype

From Ohwaka Bay, Zanzibar; deposited by Lanchester in the British Museum (Natural History).

Material

One sexually mature specimen, Park Rynie Beach (31°19'S 30°44'E), Natal coast; collected 8 September 1983.

Distribution

Ohwaka Bay, Zanzibar, and Natal coast, South Africa.

Habitat

The Park Rynie specimen occurred in sand, under rocks in the intertidal area, close to the high-water mark.

Description

Size. Trunk of preserved specimen 18 mm long, greatest diameter 6 mm. Proboscis half trunk length.

Colour. In living specimen, proboscis pale yellow, trunk reddish-purple. Colour of preserved specimen pale pink.

External features

Proboscis. Proboscis fleshy, non-deciduous, spatula-shaped in living specimens but in preserved condition lateral margins roll inwards forming a tube (Fig. 11A). Anterior and lateral margins smooth. Small, rounded papillae visible on dorsal surface under dissecting microscope. Lateral margins of proboscis united at base, forming a narrow lower lip ventral to mouth.

Trunk. Trunk broad in middle region, tapering more towards posterior end (Fig. 11A). Integument thin and transparent. Small, rounded papillae irregularly distributed over entire surface of trunk, more closely arranged at extremities. Trunk papillae larger than those on proboscis and not of uniform size. Much smaller papillae interspersed among larger ones.

Longitudinal muscle bands not visible from external surface but, under

dissecting microscope, 10 inconspicuous bands apparent only in middle region of trunk. Longitudinal and inner oblique muscles form a continuous sheet in mid-dorsal region of trunk. Oblique muscles weakly developed, arranged in fascicles between longitudinal bands.

Setae. Setae one pair, golden-yellow, located about 3 mm away from anterior end of trunk (Fig. 11A). Each seta consisting of a cylindrical shaft with a curved terminal end tapering in a sharp point (Fig. 11B). Distal third of seta much narrower. Interbasal muscle absent.

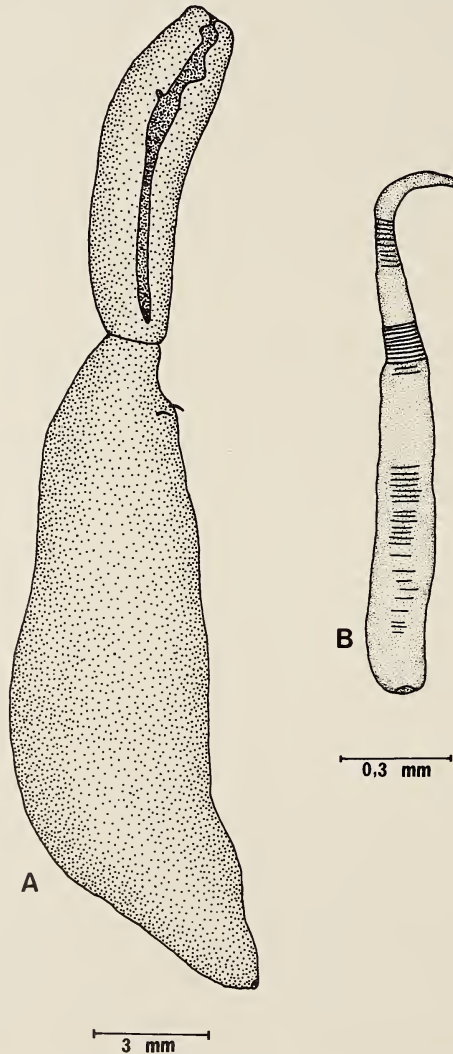


Fig. 11. *Ochetostoma decameron*. A. Ventral aspect. B. Left functional seta.

Internal anatomy

Alimentary canal. Alimentary canal comparatively short, consisting of a few irregular coils (Fig. 12A). Foregut short, narrow tube of uniform diameter, terminating at ring sinus. Thin-walled presiphonal and siphonal regions of intestine compactly filled with coarse sand grains and shell fragments. Intestinal contents not in the form of pellets. Few thin mesenteric strands fastening alimentary canal to body wall. A small spherical rectal caecum present.

Anal vesicles. Anal vesicles thin-walled transparent tubes, about half length of trunk (Fig. 12A). Ciliated funnels few, unstalked over surface of both vesicles.

Gonoducts. Gonoducts four pairs, white in colour; first pair anterior to ventral setae while remaining three pairs postsetal in position (Fig. 12B). Presetal gonoducts smallest of all, situated just anterior to cone-shaped setal sacs and partially obscured by muscle strands radiating from base of setae. Gonoducts spherical to oval and equidistant from each other. Postsetal gonoducts distended due to presence of gametes. Gonostomal lips broad, weakly coiled and large in comparison to size of gonoducts (Fig. 12C). Gonostomal openings basal in position.

Blood system. Neuro-intestinal vessels short, connecting dorsal and ventral vessels by means of intestinal ring sinus. Paired neuro-intestinals unite anteriorly before opening into ventral vessel (Fig. 13). Dorsal vessel prominent, passing anteriorly and entering proboscis. Ventral vessel continuing posteriorly, alongside nerve cord and terminating in rectal caecum.

Remarks

Ochetostoma decameron is based on a single specimen from Zanzibar, in which the proboscis was missing. Its discovery at Park Rynie is a new record for southern Africa. Lanchester's (1905) description was extremely brief and, according to Stephen & Edmonds (1972), the taxonomic position of this species is still uncertain. Nothing is known about the size of the specimen, the structure of the proboscis, the disposition of the oblique muscles, and the distribution of the dermal papillae. Lanchester mentioned the presence of four pairs of gonoducts, with the first two pairs presetal in position. The body wall is extremely thin and the longitudinal muscles are aggregated into 10 fairly broad but inconspicuous bands. According to Stephen & Edmonds (1972), the holotype in the British Museum (Natural History) is damaged and the muscle systems are not clearly evident.

Important distinguishing features of the present specimen from Park Rynie include the four pairs of gonoducts, 10 longitudinal muscle bands, a thin and transparent integument, the narrow lower lip of the proboscis and the characteristic shape and arrangement of the dermal papillae. Other features of lesser taxonomic importance are the colour and size of the specimen.

The present specimen closely approaches Lanchester's (1905) description in the number of gonoducts and longitudinal muscle bands, as well as in the nature

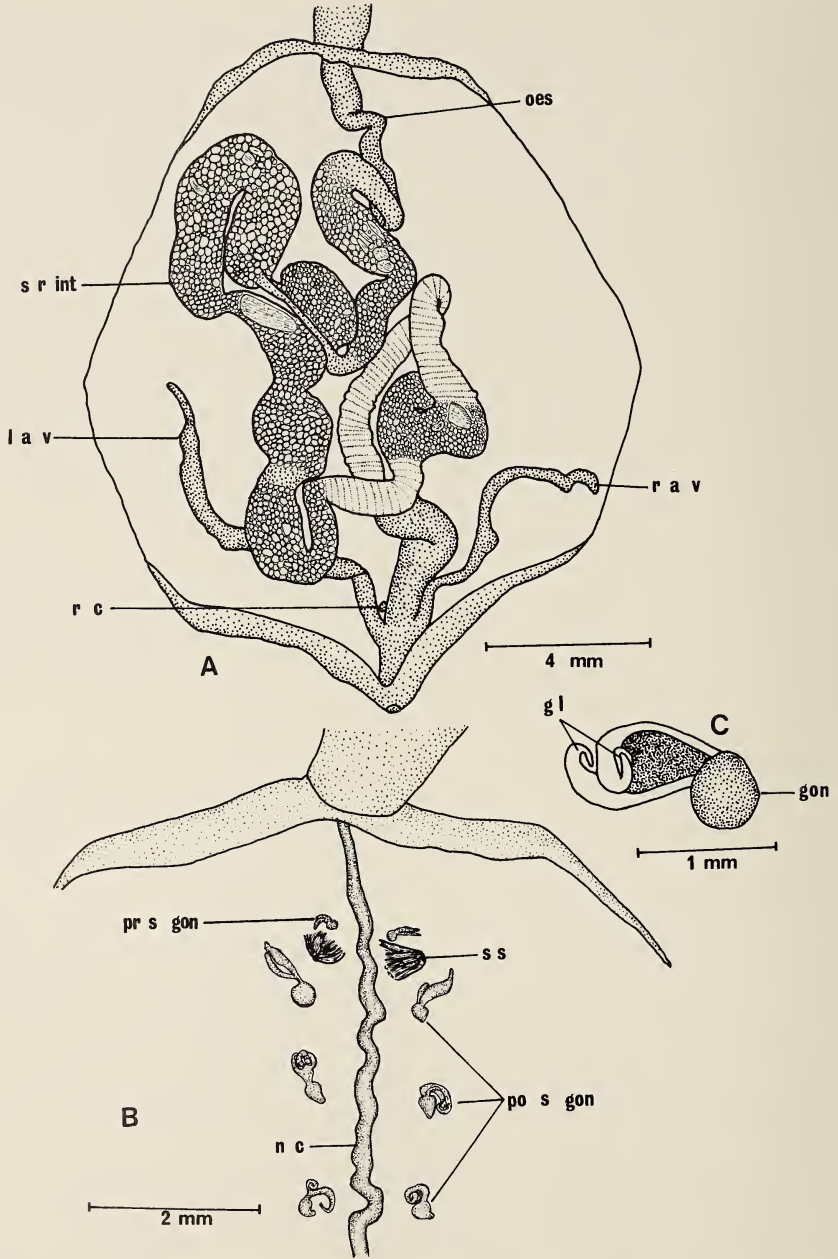


Fig. 12. *Ochetostoma decameron*. A. Dorsal dissection of the trunk, showing the alimentary system and anal vesicles. B. Anterior part of the trunk cavity showing the gonoducts. C. First postsetal gonoduct from left.

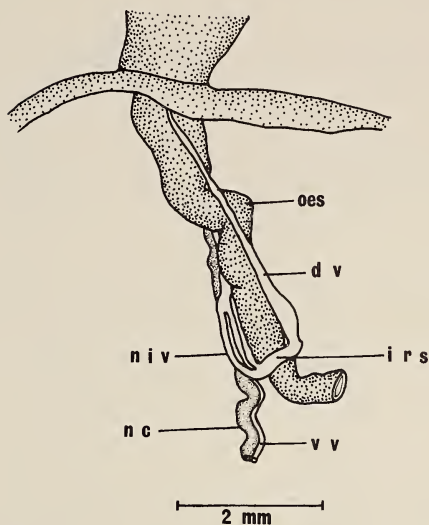


Fig. 13. *Ochetostoma decameron*. Anterior part of trunk cavity, showing blood vessels.

of the integument. An important difference, however, lies in the location of the gonoducts in relation to the ventral setae.

Ochetostoma decameron appears to be related to *O. kemp* in possessing four pairs of gonoducts. According to Prashad (1919), the trunk of *O. kemp* is 77 mm long and the longitudinal muscles are gathered into 20 bands. The integument of the latter species is thick and opaque. Hence, significant differences are present in the size of the animals, in the number of longitudinal muscle bands, and in the nature of the integument. Another distinguishing feature lies in the oblique muscles, which in *O. decameron* are weakly developed.

Additional material in the future will give a better understanding of the variations within *O. decameron* and its taxonomic position.

Ochetostoma kemp (Prashad, 1919)

Figs 14–16B

Thalassema kemp Prashad, 1919: 336, fig. 2; 1935: 41.

Ochetostoma kemp Fisher, 1946: 241. Datta Gupta & Menon, 1971: 176, fig. 2. Stephen & Edmonds, 1972: 437.

Holotype

From the Andaman Islands; deposited by Prashad in the Indian Museum, Calcutta (cat. no. W194/4).

Material

One specimen, Isipingo Beach (29°05'S 30°56'E), Natal coast; collected 12 May 1983.

Distribution

Andaman Islands and Natal coast, South Africa.

Habitat

The specimen from Isipingo Beach occurred in sand under rocks in a rock tunnel, in the intertidal zone close to the high-water mark.

Description

Size. Trunk of preserved specimen 69 mm in length, greatest diameter 16 mm. Proboscis 39 mm long, slightly exceeding half length of trunk.

Colour. In live animal, proboscis pale yellow, trunk with reddish-purple stripes marking longitudinal muscle bands. Interspaces narrow, bluish-grey in colour. In preserved condition the colour changed to light brown.

External features

Proboscis. Proboscis fleshy, non-deciduous, slightly truncated at anterior end. Spatula-shaped in live specimen but in preserved state lateral margins curl inwards forming a narrow tube (Fig. 14A). Lateral margins of proboscis smooth and free at base.

Trunk. Trunk sausage-shaped, tapering posteriorly (Fig. 14A). Small, rounded papillae irregularly distributed over entire surface of integument. Papillae minute on anterior two-thirds or more of trunk but larger posteriorly. Entire integument thick and opaque. Longitudinal muscle layer gathered into 17–19 bands; inner oblique muscles between longitudinal bands distinctly fasciculated. A pair of golden-yellow setae located about 8 mm away from anterior end of trunk.

Setae. Each seta consisting of a cylindrical shaft with curved terminal end, tapering in a pointed tip (Fig. 14B). Proximal end of shaft slightly bent. Non-functional or replacement seta small, in close association with right functional one (Fig. 14C). Fine concentric ridges on surface of both setae. Interbasal muscle absent.

Internal anatomy

Alimentary canal. Alimentary canal slightly coiled, several times length of trunk. Intestine attached to body wall at several points by very thin and elongate mesenteric strands. Ventral sheet of mesentery attaching oesophagus to body wall. Foregut small, ending at ring sinus. Intestine subdivided into presiphonal, siphonal and postsiphonal regions as in related species. Presiphonal region with ciliated groove. Intestine considerably dilated and extremely thin-walled in region of siphon. Gut compactly filled with fine sand grains and shell fragments, not moulded into pellets. Rectal caecum large and spherical (Fig. 15).

Anal vesicles. Paired anal vesicles long, slender tubes exceeding length of trunk (Fig. 15). Numerous, tiny, unstalked ciliated funnels on surface of both vesicles.

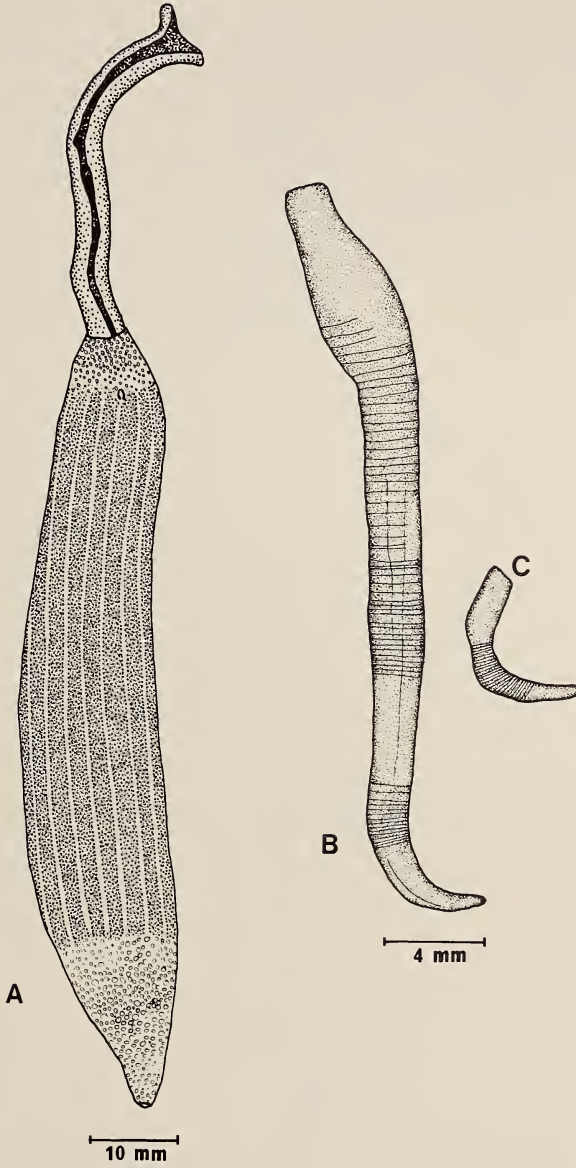


Fig. 14. *Ochetostoma kempfi*. A. Ventral aspect. B. Right functional seta. C. Much smaller, non-functional seta.

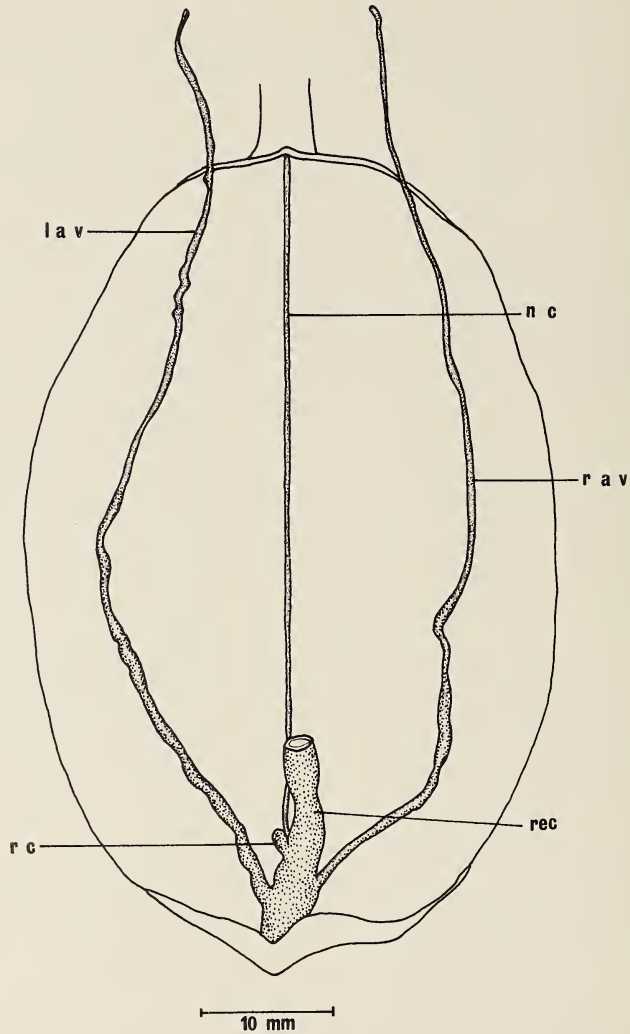


Fig. 15. *Ochetostoma kempfi*. Dorsal dissection of the trunk, showing the anal vesicles.

Gonoducts. Gonoducts four pairs, first pair presetal (Fig. 16A). Arrangement of gonoducts asymmetrical; right presetal gonoduct slightly anterior to corresponding one on left. Second and third pairs on both sides located very close to each other, with second pair anterolateral in position to third pair. First and second pairs of gonoducts small, more or less oval while fourth pair elongate, tubular and largest of all (Fig. 16A). Gonostomal lips small, spirally coiled, opening into base of gonoduct.

Blood system. Ring sinus at end of foregut is an incomplete vascular ring (Fig. 16B). Paired neuro-intestinal vessels unite prior to opening into ventral

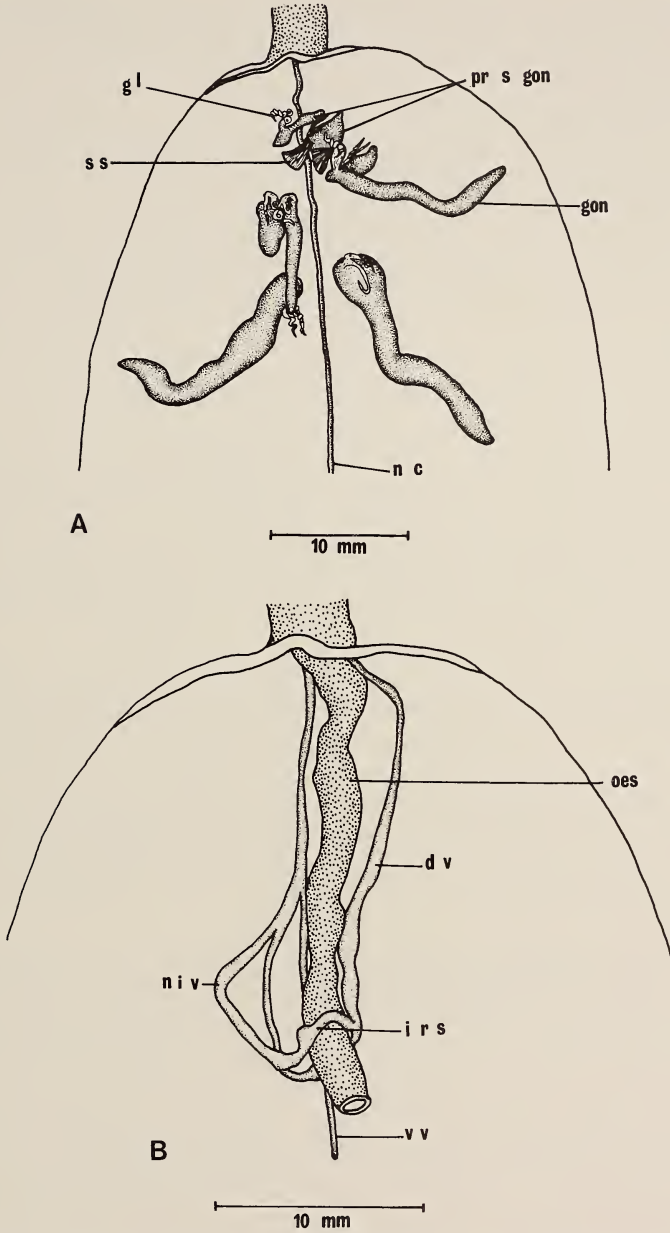


Fig. 16. *Ochetostoma kempfi*. Anterior part of trunk cavity. A. Gonoducts. B. Blood vessels.

vessel. Dorsal vessel prominent, arising from ring sinus and passing anteriorly into proboscis. Ventral vessel terminating near rectal caecum.

Remarks

The discovery of *O. kempfi* from Isipingo is a new record for southern Africa. However, it is not unexpected for this species to be found as far west as the east coast of southern Africa.

According to Prashad (1919), the trunk, which is 77 mm in length, is wider in the middle region but gradually tapers at both ends. The proboscis is short and stumpy and slightly truncated at the anterior end. It is 17 mm long and hence less than a quarter the trunk length. Prashad stated that both the proboscis and trunk are covered with papillae. On the proboscis, the papillae are minute and just visible, while on the trunk they are small anteriorly but gradually increase in size at the posterior end. A few large papillae are also scattered among the smaller ones over the whole surface. The longitudinal muscle layer is gathered into 20 bands. According to Prashad (1919), there are four pairs of gonoducts located posterior to the ventral setae. The first two pairs are poorly developed but the fourth pair is the best developed of all. The anal vesicles are very much contracted and about one-third the length of the trunk. Prashad (1935), however, re-examined the holotype of *O. kempfi* and found that the first two pairs of gonoducts were presetal in position.

The present specimen from Isipingo differs from the type specimen in several respects. The most important differences lie in the position of the gonoducts in relation to the ventral setae, the size and arrangement of the dermal papillae, and the length of the anal vesicles. The papillae on the anterior two-thirds of the trunk are small and evenly distributed and are not interrupted by larger papillae. The differences in the size of the proboscis and anal vesicles could be due to different degrees of contraction of these organs during narcotization and fixation. It is very likely that Prashad's (1919) description was based on a specimen that was highly contracted.

Datta Gupta & Menon (1971) identified a specimen, also collected from the Andaman Islands, as *O. kempfi*. According to these authors, the proboscis is nearly tubular with the lateral margins slightly indented. The body is covered with rounded papillae that are prominent towards the posterior end. An interesting feature about their specimen is that the extreme posterior end of the trunk is devoid of papillae and is made up of concentric fleshy rings. The longitudinal muscle layer is gathered into 20 bands. These authors also mentioned the presence of four pairs of gonoducts, with the first pair presetal in position. Hence the arrangement of the gonoducts, in relation to the ventral setae, conforms with that of the specimen from Isipingo. The size and distribution of the dermal papillae and the anatomy of the blood system are also very similar. The specimen described by Datta Gupta & Menon (1971), however, differs in lacking a rectal caecum. The posterior end of the trunk of their specimen also appears to be rather unusual. Unfortunately, these authors did not give any details regarding

the size of their specimen. However, from their illustration it is apparent that the proboscis is about half the length of the trunk.

The specimen from Isipingo is ascribed to *O. kemp*i on the basis of the number of gonoducts and longitudinal muscle bands. According to Datta Gupta (1976) and Saxena (1983), the number of gonoducts is constant within a species and is an important taxonomic character in echiurans.

*Ochetostoma kemp*i appears to be related to *O. decameron* in possessing four pairs of gonoducts. Significant differences, however, occur in the size of the animals, in the number of longitudinal muscle bands and in the nature of their integuments. Additional material in the future should give a better understanding of the variations within *O. kemp*i.

Ochetostoma palense (Ikeda, 1924)

Figs 17–19B

Thalassema palense Ikeda, 1924: 39, figs 13–15.

Ochetostoma palense Stephen & Edmonds, 1972: 440.

Material

One specimen, Isipingo Beach (29°05'S 30°56'E), Natal coast; collected 13 June 1983.

Distribution

Known only from the holotype from Palau Islands, Japan, and Natal coast, South Africa.

Habitat

The Isipingo specimen occurred in coarse sand under rocks in a rock tunnel, in the intertidal area, close to the high-water mark.

Description

Size. Trunk of preserved specimen 22 mm long, greatest diameter of trunk 7 mm. Proboscis 7 mm long, about one-third trunk length.

Colour. In living specimen, proboscis pale yellow, trunk reddish-purple. Preserved specimen white.

External features

Proboscis. Proboscis spatulate, non-deciduous; lateral margins smooth and free at base. When preserved, lateral edges of proboscis curl inwards forming a tube (Fig. 17A).

Trunk. Trunk cylindrical, tapering gradually towards posterior end (Fig. 17A). Anus at tip of small conical projection. Papillae small, rounded, irregularly distributed over entire surface of trunk, more closely arranged at posterior end. Integument extremely thin and transparent. Nerve cord and other internal organs visible through transparent body wall. Longitudinal muscle bands

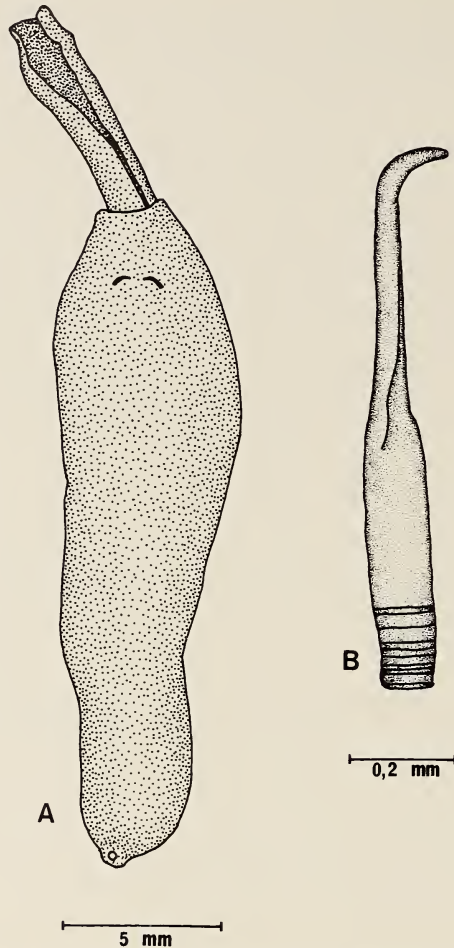


Fig. 17. *Ochetostoma palense*. A. Ventral aspect. B. Right functional seta.

not visible externally. In dissected specimen, 15 inconspicuous muscle bands apparent only in posterior half of trunk. Interspaces narrow. In anterior half of trunk longitudinal and oblique muscles form a continuous sheet. Oblique muscles between longitudinal bands weakly fasciculated.

Setae. Setae minute, golden-yellow, about 3 mm away from anterior end of trunk. When dissected out and viewed under compound microscope, each seta consists of a straight shaft with a curved terminal end (Fig. 17B). Proximal half of shaft broader with a few concentric markings at base. Interbasal muscle absent.

Internal anatomy

Alimentary canal. Alimentary canal comparatively short, about three times trunk length and with relatively few coils (Fig. 18). Intestine attached to body

wall by a few thin mesenteric strands. Foregut is a narrow tube, about 4 mm long, ending at ring sinus. Presiphonal region of intestine 6 mm in length, marked by presence of a ciliated groove. Ciliated groove commences soon after ring sinus and leads into intestinal siphon. Siphonal region of intestine considerably dilated and extremely thin-walled. Intestine narrows in postsiphonal region and leads into more or less straight rectum. A small, spherical rectal caecum present.

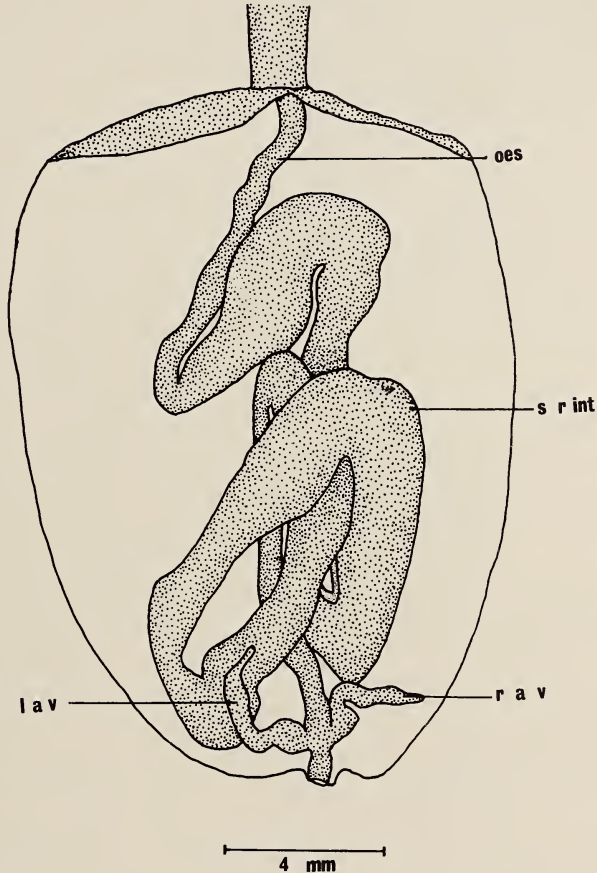


Fig. 18. *Ochetostoma palense*. Dorsal dissection of the trunk, showing the alimentary canal.

Anal vesicles. Anal vesicles (Fig. 18) small, less than one-quarter trunk length. Ciliated funnels minute, unstalked, on surface of both vesicles.

Gonoducts. Gonoducts three pairs, spherical to somewhat oval in shape with weakly coiled gonostomal lips (Fig. 19A). First pair of gonoducts presetal. Gonostomal lips broad, unlike condition in several other species of *Ochetostoma*. Second and third pairs of gonoducts much larger than first pair.

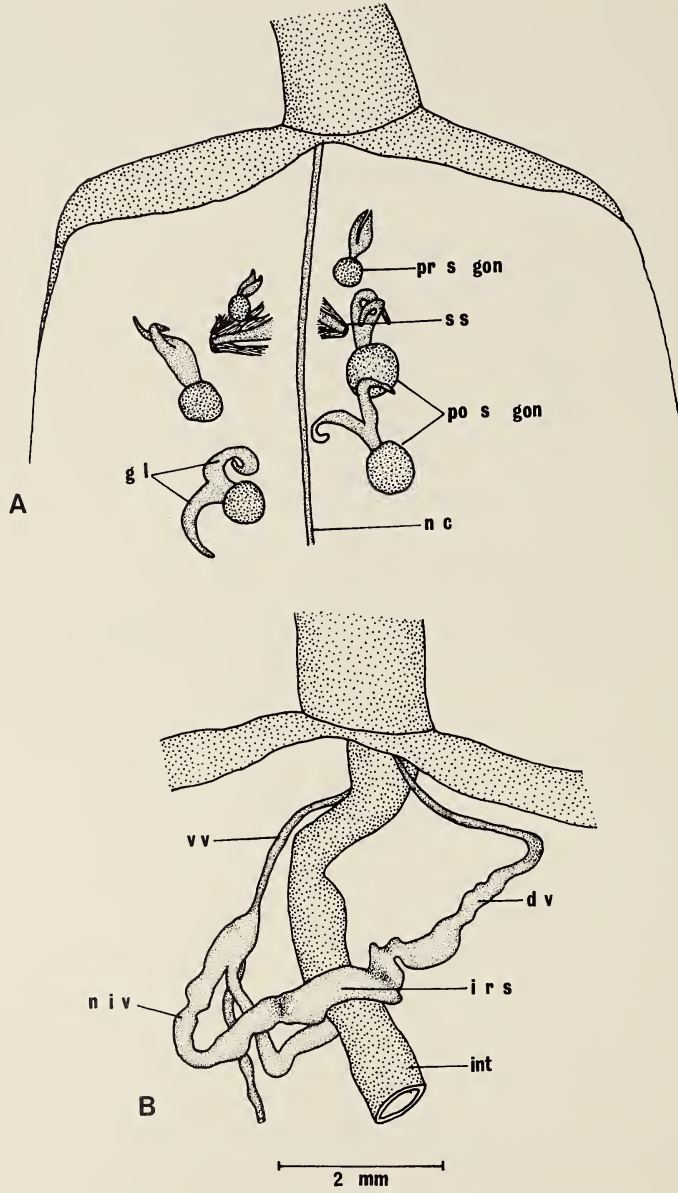


Fig. 19. *Ochetostoma palense*. Anterior part of the trunk cavity.
A. Gonoducts. B. Blood vessels.

Blood system. Intestinal ring sinus is an incomplete vascular ring at end of foregut (Fig. 19B). Paired neuro-intestinal vessels unite before opening into ventral vessel. Dorsal vessel prominent, arising from ring sinus and entering proboscis.

Remarks

Ochetostoma palense (Ikeda, 1924) is based on a single specimen from Palau Islands, Japan. The holotype is small, about 22 mm in its entire length, of which about one-quarter belongs to the proboscis. The pear-shaped trunk is 8 mm at its widest part. Ikeda mentioned that the animal is uniformly bright green in life. The thin and transparent integument is covered with minute papillae, which are larger and more closely arranged at the extremities of the trunk. The longitudinal muscles are gathered into 15 bands that are apparent only on a small portion of the anterior part of the trunk. An interbasal muscle is absent. There are three pairs of spherical gonoducts with slightly coiled gonostomal lips. The first pair of gonoducts are presetal. The anal vesicles are thin-walled tubes, over half the length of the trunk, with few unstalked funnels. A rectal caecum is absent. According to Ikeda (1924) the alimentary canal is short as compared with the size of the animal, with a few irregular coils.

The present specimen from Isipingo is similar to the Japanese specimen in size, distribution of the dermal papillae, the nature of the integument, as well as in the number of gonoducts and longitudinal muscle bands. In both specimens the gonostomal lips are weakly coiled. The specimen from Isipingo, however, differs in possessing a rectal caecum. Differences are also present in the colour of the animals as well as in the lengths of the anal vesicles.

Ochetostoma palense appears to be closely related to *O. erythrogrammon* Leuckart & Rüppell, 1828, and Wesenberg-Lund (1939) considered the species to be synonymous. However, there are several features that tend to separate the two species. An interesting feature of the specimen from Isipingo is that the alimentary canal is comparatively short, about three times the trunk length. In *O. erythrogrammon* it is long and highly coiled, and measurements made in a few specimens have shown that it is five times as long as the trunk. The gonostomal lips of *O. palense*, unlike those of *O. erythrogrammon*, are not thread-like and are only weakly coiled. Another distinguishing feature is that the longitudinal muscle bands of *O. palense* are not conspicuous throughout the trunk. Furthermore, the oblique muscles between the longitudinal bands are very weakly developed.

Stephen & Edmonds (1972) refrained from placing *O. palense* in the synonymy of *O. erythrogrammon* mainly because of the differences in the dimensions of the alimentary canal and in the disposition of the gonostomal lips. In view of the above differences, it has been decided to retain *O. palense* as a species distinct from *O. erythrogrammon*. Any further decisions will have to await the collection of more, preferably adult, material.

Ochetostoma arkati (Prashad, 1935)

Thalassema arkati Prashad, 1935: 41, figs 1-4.

Ochetostoma arkati: Wesenberg-Lund, 1959: 203, figs 13-14; 1963: 141.

Type-locality

Sandheads off the mouth of the River Hooghly, Ganges Delta, Calcutta.

Diagnosis

Proboscis short and stumpy, a third to a quarter of total length of animal; edges of posterior half form short, branched, gill-like processes. Ventral margins of proboscis free at base. Dorsal surface of proboscis smooth; ventral side trough-shaped, deepest at proximal end. Trunk oval, up to 38 mm in length, covered with minute, round to oval papillae, which are very sparse or absent in middle region. Borders of anus deeply crenulated and scalloped. Area around anus smooth, thin-skinned and devoid of papillae. Longitudinal muscle layer gathered into 7-8 bands, separated by broad interspaces. Two pairs of postsetal, tubular gonoducts almost as long as trunk; gonostomal lips elongate and spirally coiled. Anal vesicles yellowish, very thin and about one-third length of animal.

Distribution

Calcutta, India (Prashad 1935); African coast, Nigeria and Cape Town (Wesenberg-Lund 1959), and Port Elizabeth (Wesenberg-Lund 1963). It is very likely that this species is widely distributed through the western part of the Indo-Pacific, and the southern part of the eastern Atlantic.

Remarks

Wesenberg-Lund's (1959, 1963) material agreed with Prashad's (1935) description, except that the number of longitudinal muscle bands was 7-8 instead of eight. *Ochetostoma arkati* is adequately described and is distinct from all the other species in the genus in possessing branched, gill-like processes along the edges of the posterior half of the proboscis.

Ochetostoma capense Jones & Stephen, 1955

Ochetostoma capensis Jones & Stephen, 1955: 273, figs 1-3. Wesenberg-Lund, 1963: 142.

Diagnosis

Proboscis small, in preserved specimens about one-eighth of trunk length and in living specimens one-twelfth to one-third; ventral edges crenate when proboscis is extended, but thrown into a series of tight ridges when contracted. Colour varies from cream, through different shades of cream-yellow, to light orange. Trunk up to 120 mm when fully extended, thickly covered with papillae on anterior ventral surface but fewer at posterior end. Papillae dispersed in rows in middle region of trunk. Colour of trunk variable, ranging from dark grey-brown to purple-brown. Trunk cylindrical or sausage-shaped and typically widest

at posterior end. Longitudinal muscles gathered into seven main bands, most conspicuous at ends of trunk. A few weakly developed bands occur in between the main bands. Two pairs of tubular, postsetal gonoducts, usually half to three-quarters as long as trunk, but sometimes quite short. Gonostomal lips extended into long spiral filaments. Interbasal muscle present, passes through a loop of neuro-intestinal vessel. Anal vesicles long, thin, brown tubes of variable length, from one- to three-quarters of trunk length and bearing minute, ciliated funnels, which are most numerous towards the free ends of the vesicles. Rectal caecum present.

Distribution

Zwartkops River, Langebaan Lagoon and Durban Bay (Jones & Stephen 1955).

Remarks

Ochetostoma capense is based on a large number of specimens. It is the only estuarine species recorded from southern Africa, and is probably endemic. This species appears to be related to *O. septemyotum* Datta Gupta, Menon & Johnson, 1963, but differs significantly in the structure of the proboscis. This species has been illustrated and fully described (Jones & Stephen 1955).

Ochetostoma sp.

Figs 20–23

Material

One sexually mature female, Park Rynie Beach, Natal; collected 7 June 1982.

Habitat

The specimen occurred in the intertidal zone in relatively coarse sand under a projecting ledge of rock facing the shore.

Description

Size. Trunk of preserved specimen 40 mm in length, greatest diameter 8 mm. Proboscis 11 mm, about one-quarter as long as trunk.

Colour. Proboscis pale yellow in living specimen. Longitudinal stripes marking longitudinal muscle bands dark red, interspaces bluish-grey. Colour of preserved specimen pale pink.

External features

Proboscis. Proboscis non-deciduous, shovel-shaped with smooth lateral and terminal margins (Fig. 20). Lateral margins of proboscis fuse at base forming a narrow lower lip ventral to mouth. Ventral groove of proboscis smooth but dorsal surface covered with minute, densely arranged, rounded papillae.

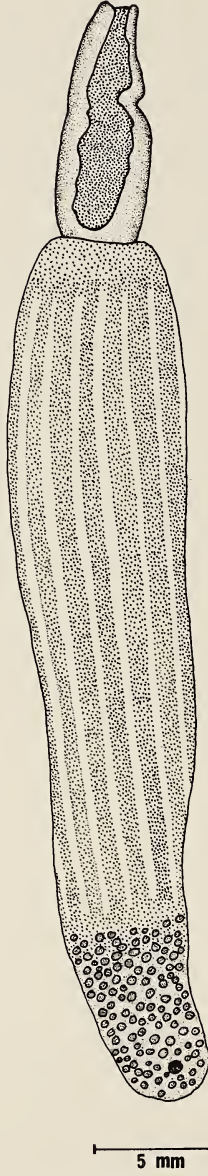


Fig. 20. *Ochetostoma* sp. Ventral aspect.

Trunk. Trunk sausage-shaped, tapering more towards posterior end (Fig. 20). Entire integument densely covered with small, rounded papillae. Papillae much larger and white in colour at posterior end of trunk. Longitudinal muscles aggregated into 20 bands; inner oblique muscles between longitudinal bands distinctly fasciculated. Entire integument thick and opaque. Ventral setae missing. Two tiny scars on integument indicate that setae have fallen off. Interbasal muscle absent.

Internal anatomy

Alimentary canal. Alimentary canal long, consisting of several ascending and descending limbs. An interesting feature is the presence of numerous, closely arranged, white mesenteric strands along entire length of gut (Fig. 21). Oesophagus comparatively short, terminating at ring sinus. A ventral sheet of mesentery fastens oesophagus to body wall. Intestine shows usual divisions into presiphonal, siphonal and postsiphonal regions. Presiphonal region of intestine with a ciliated groove commencing soon after ring vessel. In region of siphon, intestine considerably dilated and thin-walled. A small, spherical rectal caecum present.

Anal vesicles. Anal vesicles paired distensible tubes exceeding length of trunk (Fig. 21). Both vesicles covered with tiny, unstalked ciliated funnels. Funnels more numerous at distal ends of vesicles.

Gonoducts. Gonoducts three pairs, tubular, light brown in colour. First pair smallest, located anterior to ventral setae (Fig. 22A). Gonostomal lips small, weakly coiled (Fig. 22B), unlike condition in several other species of *Ochetostoma*. Gonostomes robust, and not thread-like in appearance. Proximal end of gonostome broad and sac-like. All gonoducts compactly filled with eggs, visible through transparent wall.

Blood system. Ring sinus is an incomplete vascular ring located at end of foregut (Fig. 23). Paired neuro-intestinal vessels unite before opening into ventral vessel. As in other species, dorsal vessel passes anteriorly and enters proboscis.

Remarks

Important features of the present specimen include: the presence of an unusually large number of mesenteric strands attaching the gut to the body wall, the structure of the gonostomes, and the 1 : 4 ratio of the proboscis to the trunk length. Another distinguishing feature seems to be the small size of the sexually mature specimen.

Ochetostoma erythrogrammon, *O. caudex*, *O. palense*, *O. australiense* and *O. indosinense* possess three pairs of gonoducts and 12–22 longitudinal muscle bands and hence appear to be related to this specimen from Park Rynie.

The trunk length of sexually mature specimens of *O. caudex* ranges from 72 mm to 105 mm (Biseswar 1983), and in *O. erythrogrammon* from 80 mm to 160 mm (Stephen & Edmonds 1972). In both these species, the proboscis is one-third to three-quarters as long as the trunk. This sexually mature specimen of

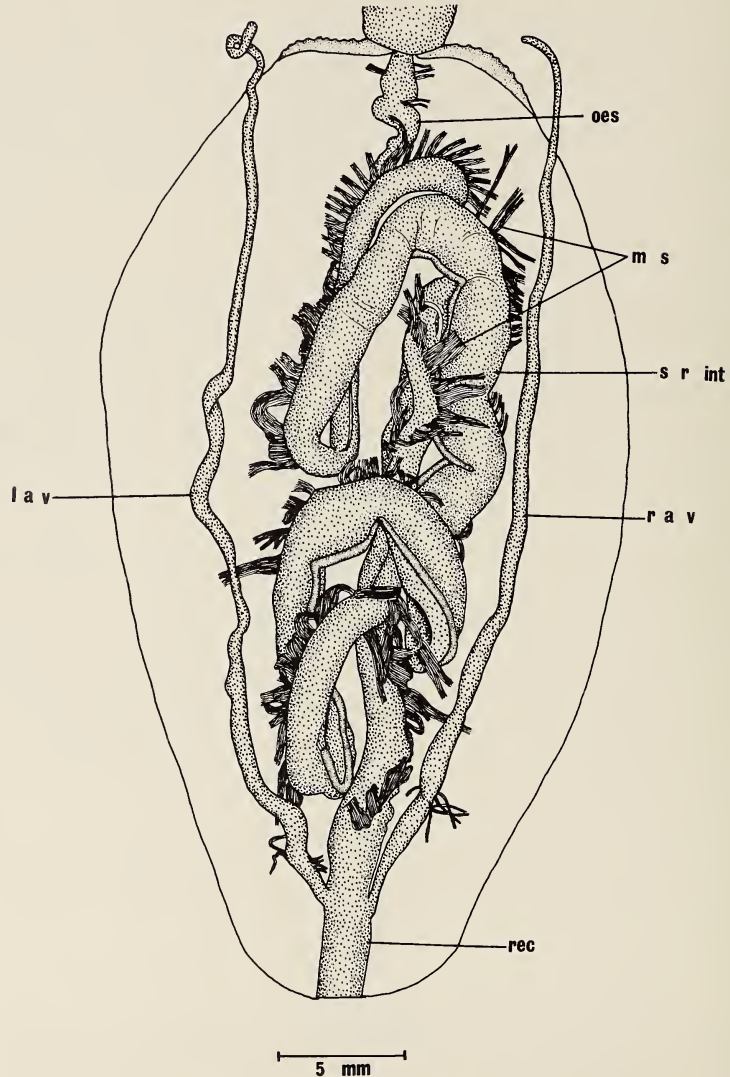


Fig. 21. *Ochetostoma* sp. Dorsal dissection of the trunk, showing the alimentary system and anal vesicles.

Ochetostoma sp., however, is small, with a trunk length of only 40 mm and the proboscis is about one-quarter as long.

In addition, this specimen has a proboscis in which the lateral margins unite posteriorly to form a narrow lower lip.

Another distinguishing feature of the present specimen lies in the structure of the gonostomes. The gonostomal lips, unlike those of *O. caudex* and *O. erythrogrammon*, are comparatively small and are not spirally coiled. Furthermore, in

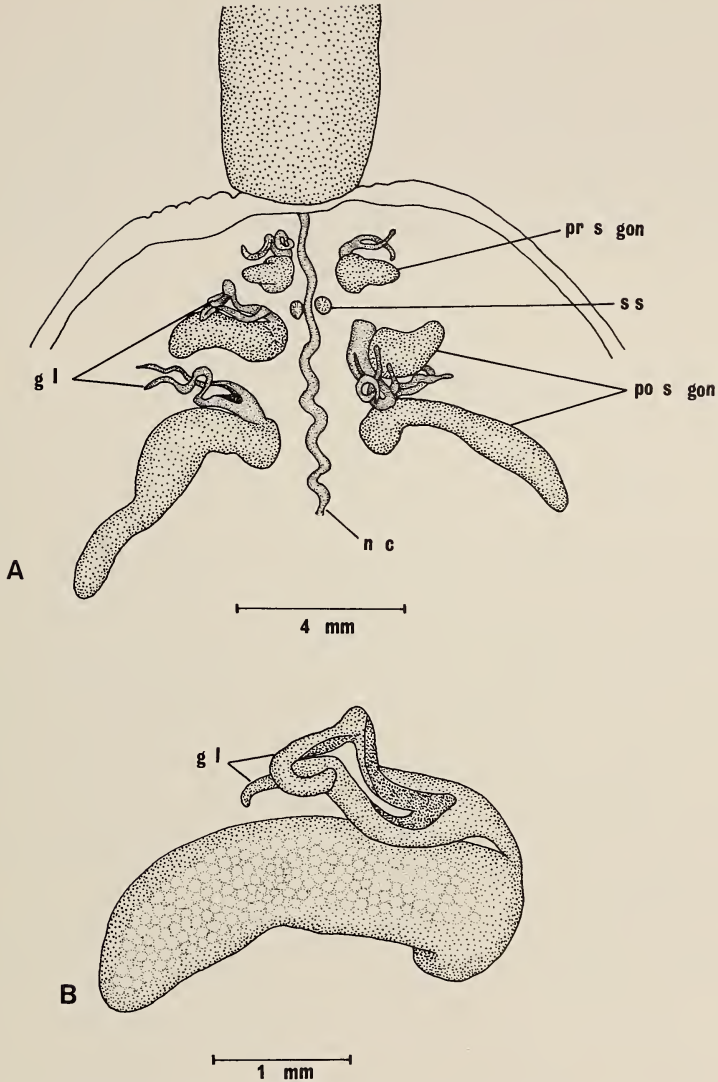


Fig. 22. *Ochetostoma* sp. A. Anterior part of trunk cavity, showing the gonoducts. B. First postsetal gonoduct.

the latter two species, the mesenteric strands that fasten the gut to the body wall are relatively few.

In *O. palense* the trunk is 22 mm long and the integument is thin and transparent. Furthermore, the longitudinal muscle layer is gathered into 15 bands, which are apparent only on a small portion of the anterior part of the trunk. Hence *O. palense* differs from the present specimen in size as well as in the nature of the integument. Another important feature that distinguishes